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AST News Bulletin

News from the Associate Administrator for Commercial Space Transportation

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SEA LAUNCH MISSION SUCCESSFUL!

PACIFIC OCEAN - - JUNE 10, 2003 - - Sea Launch Limited Partnership launched a Zenit-3SL launch vehicle on June 10, 2003, at 154 degrees West Longitude on the equator in the Pacific Ocean. The Zenit-3SL launch vehicle carried the Thuraya D2 satellite to a geostationary transfer orbit. The Thuraya D2 is a Geomobile (GEM) 702+ spacecraft manufactured by Boeing Satellite Systems for Thuraya Satellite Telecommunications Company based in the United Arab Emirates (UAE). Thuraya is designed to operate in geostationary orbit (approximately 22, 236 miles above the equator), providing satellite-based mobile telephone services to countries in Europe, the Middle East, North and Central Africa, the Commonwealth of Independent States (CIS) countries and South Asia. The FAA granted Sea Launch Limited Partnership a launch operator's license authorizing this launch activity. The FAA had two safety inspectors on site to perform a safety inspection of the FAA licensed launch operations.

The Zenit Rocket aboard the Sea Launch platform in the Pacific Ocean

Successful Atlas V Mission at Cape Canaveral

Headquarters AST staff supported by AST's Commercial Space Transportation Safety Office at Patrick Air Force Base, inspected and monitored launch activities associated with the launch of Lockheed Martin's Atlas V launch vehicle from Launch Complex 41 (SLC 41) at Cape Canaveral Air Force Station (CCAFS), Florida. The launch payload, Hellas-Sat 2, a Greek telecommunications satellite, is the first domestic satellite for Greece and Cyprus. It will provide voice, Internet, video and broadcast services to European and Balkan markets as well as broadcast the Athens 2004 Summer Olympics.

On May 12, the scheduled launch date, operations proceeded normally with a planned launch window from 5:57 to 6:31 p.m. EDT. Prelaunch weather forecasts predicted a 30% chance of a weather constraint violation due to cumulus clouds in the launch area. The countdown proceeded smoothly until problems developed shortly after the mobile launch platform (MLP) rolled the Atlas V to SLC 41. A remote data unit (RDU), on the Centaur upper stage began experiencing voltage anomalies. The RDU is a part of the Atlas V data acquisition system. Troubleshooting efforts failed and the launch was scrubbed approximately 5 hours prior to the scheduled opening of the launch window. The MLP rolled the Atlas V back to the Vertical Integration Facility (VIF) where the RDU was replaced during the night with a functioning unit from another Atlas V vehicle (AV-003).

Countdown for the second launch attempt of the mission began on Tuesday, May 13. The launch window remained unchanged. The count proceeded smoothly with no launch vehicle or Range issues. The 45th Space Wing Safety Office announced a 7-minute collision avoidance (COLA) hold for the International Space Station (to preclude any possibility of collision between the Space Station and the rocket stages). However, the launch was scheduled to proceed before the COLA. Launch officials were preparing to come out of a planned built-in hold at T-4 minutes when the Eastern Range discovered two boats within the hazard area. The Range had insufficient time to clear the boat area and the built-in hold was extended. The extended hold continued into the opening portion of the launch window and then to the beginning of the COLA period. Once the COLA period expired and the Surveillance Control Officer (SCO) cleared the boats, the count resumed and progressed without further delay.

Atlas V Lifts off from SLC 41

Liftoff of the Atlas V occurred at 6:10 p.m. EDT (2210 Z). The launch was uneventful and the payload was successfully delivered to supersynchronous transfer orbit. Ground stations acquired a signal from the satellite. The Atlas V vehicle placed the satellite into a nearly perfect transfer orbit of 85,458 km (apogee) by 312.2 km (perigee), and an inclination right on target at 17.06 degrees. Residual fuels in the Centaur upper stage were vented, as required by FAA regulations, to prevent the possibility of an on-orbit explosion that would

(Atlas V Mission continued from page 2)

generate large amounts of debris. The FAA Inspection Team reported that there were no safety issues.

This mission accomplished a first for the Atlas V program – rollout and launch on the same day. The launch vehicle was transported from the VIF to the launch pad aboard a 1.4-million pound mobile launching platform only nine-and-a-half hours before liftoff.

New Employees in AST

Paula Trimble is a Space Transportation Industry Analyst in AST's Space Systems Development Division (AST-100). Ms. Trimble came to AST from the Office of Space Commercialization at the U.S. Department of Commerce, where she participated in interagency space policy formulation, provided support to the Interagency GPS Executive Board, developed GPS outreach and education activities, and helped prepare studies on space economic data, near-term market opportunities in space, and suborbital reusable launch vehicles and applicable markets. In AST she will be responsible for preparing AST's Quarterly Launch Reports and the annual Commercial Space Transportation Developments and Concepts report. She will also cover policy and topical areas of interest to AST, including spaceports and launch site security, orbital debris, GPS and interagency activities on the peaceful use of outer space.

Karen Shelton-Mur is a weather analyst in AST's Systems Engineering and Training Division (AST-300). Ms. Mur has a B.S. & M.S. in Meteorology from Texas A&M University (College Station, TX). During her studies, she interned with the National Weather Service Forecast Office in Houston and the NWS/Spaceflight Meteorology Group at NASA's Johnson Space Center. Upon graduation, she worked for Raytheon Systems at Johnson, on the International Space Station (ISS) Training Simulator. Ms. Mur began her career in the Air Force Air Weather Service as a weather observer, providing Space Shuttle weather support and other functions. After Active Duty, she joined the 111th Weather Flight in the Texas Air National Guard and is currently a First Lieutenant in the Texas Air National Guard.

AST CONDUCTS RLV WORKSHOP

On May 22, 2003, AST held an application workshop for potential reusable launch vehicle (RLV) mission commercial launch license applicants. The workshop aimed to provide the RLV industry with a more thorough understanding of FAA's Part 431 RLV regulations. AST engineers focused on the license application submittal requirements necessary to show AST that the RLV operators were complying with Part 431 regulations and provided examples of acceptable methods for compliance. The RLV workshop was greeted with enthusiasm by the representatives of the RLV industry and proved beneficial to all involved, including AST. AST plans to follow-up this workshop with a Launch Site applicant workshop in the near future.

George Nield, AST-2 at the RLV Workshop

AST staff members instruct industry on RLV regs.

SUCCESSFUL PEGASUS LAUNCH--VANDENBERG AIR FORCE BASE - - JUNE 26, 2003 - - Orbital Sciences Corporation launched Orbview-3 on its Pegasus launch vehicle at 2:53 p.m. (EDT). Pegasus was carried aloft beneath Orbital's "Stargazer" L-1011 carrier aircraft. It was released at 39,000 feet into a planned free fall for 5 seconds over the Pacific Ocean before ignition of the first stage rocket motor. The successful launch is the 150th FAA-licensed launch.

Orbview-3 has imagery capability for one-meter visible light and four-meter multi-spectral resolution. It will provide imagery useful for a variety of applications such as mapping and surveying, agriculture and forestry, telecommunications and utilities, oil and gas, and national security. One-meter imagery will enable the viewing of houses, automobiles and aircraft, and can produce high precision digital maps and 3-dimensional fly-through scenes. Four-meter multispectral imagery can produce color and infrared information to characterize rural areas, cities and undeveloped land. The satellite will revisit each location on Earth in less than 3 days with an ability to turn from side to side up to 45 degrees. Orbview-3 imagery will be downlinked in real-time to ground stations located around the world or stored onboard the satellite and downlinked to ORBIMAGE's master U.S. ground stations. Two current AST staff members participated in the design and integration of Orbview-3 while they were employed at Orbital Sciences Corporation.

OSC'S Pegasus Launch Vehicle

SPRING 2003 COMSTAC MEETING - - WASHINGTON, DC - - MAY 21 - - The 2003 spring meeting of the Commercial Space Transportation Advisory Committee (COMSTAC) was held at FAA Headquarters on May 21st. The meeting was chaired by Livingston L. Holder, Jr., Vice President of Space Systems, Andrews Space and Technology, Seattle, Washington. Highlights of the meeting included an update on the Global Positioning Satellite System by the Honorable Jeffrey N. Shane, DOT's Under Secretary for Policy, a briefing on Air Force and NASA Joint Activities by Br. Gen. Simon Worden, Director of Development and Transformation for the Air Force Space and Missile Systems Center, and the release of the ***2003 Commercial Space Transportation Market Forecasts.*** This publication includes the *COMSTAC 2003 Commercial Geosynchronous Orbit Launch Demand Model* and the *FAA/AST 2003 Commercial Space Transportation Forecast for Non-Geosynchronous Orbits*. To access the 2003 Commercial Space Transportation Market Forecasts, visit AST's website at http://ast.faa.gov/rep_study/forcasts_and_reports.htm. For other available presentations from the COMSTAC meeting, go to http://ast.faa.gov/comstac/meetings.htm.

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INAUGURAL LAUNCH OF ATLAS V 500 SERIES LAUNCH VEHICLE - - Lockheed Martin is scheduled to launch the Rainbow-1 satellite on its first Atlas V 500 series launch vehicle on July 17 from Space Launch Complex 41 at Cape Canaveral Air Force Station, Florida. Rainbow-1 was built by Lockheed Martin Commercial Satellite Systems. It will be owned and operated by Cablevision Systems Corporation and provide locally oriented television programming direct-to-home service to major metropolitan markets in the eastern United States. Lockheed Martin has successfully launched two Atlas V 401 launch vehicles.

The Atlas V family of launch vehicles is based on a newly developed 12.5 ft diameter common core booster (CCB) that is powered by a Russian RD-180 engine. The Atlas V consists of 400 and 500 series configurations that differ by payload fairing options and the number of Solid Rocket Boosters (SRBs). Both Atlas V 400 and 500 configurations incorporate a stretched version of the Centaur upper stage, which can be configured as a single-engine Centaur or a dual engine Centaur. The Atlas V 500 series can also tailor performance by incorporating from zero to five SRBs. A three-digit naming convention for the Atlas V launch vehicle system identifies its multiple configuration possibilities. The first digit identifies the diameter class (in meters) of *ATLAS V 521* the payload fairing (4 or 5 m); the second digit indicates the number of SRBs used (zero for Atlas V 400 and zero to five for Atlas V 500); and the third digit represents the number of Centaur engines (one or two). Hence, the Atlas V 521 has the 5-meter fairing, two SRBs, and a Centaur upper stage with one engine.

Atlas V 521

The CCB burns kerosene (specifically, RP-1) and liquid oxygen. The SRBs use propellant consisting of finely ground aluminum as the combustible ingredient, ammonium perchlorate oxidizing crystals, and a rubber-like binder called hydroxy-terminated polybutadiene (HTPB). The Centaur upper stage burns liquid hydrogen and liquid oxygen.

Atlas V Payload in kg - Configuration By Orbit

Configuration	LEO 28 deg	LEO Polar	Geosynchronous Transfer Orbit	Geosynchronous Orbit
Atlas V 401	12,500	10,750	5,000	N/A
Atlas V 501	10,300	9,050	4,100	1,500
Atlas V 511	12,050	10,200	4,900	1,750
Atlas V 521	13,950	11,800	6,000	2,200
Atlas V 531	17,250	14,600	6,900	3,000
Atlas V 541	18,750	15,850	7,600	3,400
Atlas V 551	20,050	17,000	8,200	3,750

AST SUPPORTS AIR TRAFFIC WITH 14 CFR PART 101 WAIVER DETERMINATIONS - - NORTHWESTERN NEVADA - - MAY 31, 2003 - - SM Rocketry, composed of two aerospace engineers, launched a three-stage, unguided rocket from a desolate location in Northeastern Nevada. The launch weather conditions were ideal; low winds, no clouds and unrestricted visibility. The rocket was designed to achieve a final altitude of around 300,000 feet, however, due to anomalies and the third-stage ignition abort initiated by the onboard Flight Safety System (FSS), the rocket reached a maximum altitude of approximately 31,000 ft. The proposed launch activity was exempt from AST licensing requirements because it fit within the parameters of amateur rocket activity, as defined in 14 CFR § 401.5. Amateur rocket activities means launch activities conducted at private sites involving rockets powered by a motor or motors having a total impulse of 200,000 pound-seconds or less and a total burning or operating time of less than 15 seconds, and a rocket having a ballistic coefficient less than 12 pounds per square inch. Although the launch activities were within the amateur realm, the launch needed to comply with FAA Air Traffic regulations in 14 CFR part 101. One provision in the part 101 regulations, 14 CFR § 101.7, states that no person may operate an unmanned rocket in a manner that creates a hazard to other persons, or their property. The AST Licensing and Safety division, in accordance with an agreement between ATA-400, reviews launch waiver applications above 25,000 feet to ensure that no person operates an unmanned rocket in a manner that creates a hazard to other persons or their property. When conducting amateur rocket activities of this magnitude other regulations, such as 14 CFR § 101.23 operating limitations and 14 CFR § 101.25 notice requirements, need to be considered. To ensure compliance with the public safety criteria, AST performs a safety analysis of the rocket and launch operations. AST engineers gather relevant rocket data such as mass properties, aerodynamic characteristics and motor performance information. Based on these data, AST conducts a trajectory analysis using specialized software. The software outputs useful values such as altitude, range, thrust, and velocity at specified time intervals. Variation with the rocket, launch rail, and atmosphere are usually introduced to determine allowable launch constraints. For example, a wind model can be introduced into the trajectory analysis and altered until the program shows the rocket will travel beyond the designated flight area. Once maximum wind constraints are known a safety margin can be implemented and the FAA can require launch site wind conditions to be below the determined values. Rocket failure modes, such as recovery parachute failure, can also be simulated. Another portion of the safety analysis includes an examination of the launch area and peripheral land. In particular the FAA is concerned with population densities and ensuring the launch meets E_c (expected casualty) criteria. Expected casualty is used in the space industry as a measure of risk to public safety from a specific mission, and is one of the factors typically used within the U.S. Government to determine if a mission may proceed. Expected casualty is the average number of human casualties per mission. Human casualty is defined as a fatality or serious injury and an acceptable E_c value, for FAA-licensed launches, is less then 30 casualties in a million launches. (Note that this was not a FAA-licensed launch.) There has never been a fatality resulting from a commercial launch or an amateur launch that was evaluated by AST. One way to keep the E_c value to a minimal is by launching from unpopulated areas. The Northeastern Nevada launch site was chosen because the location is isolated from human inhabitants. The closest town is Montello, NV, located approximately 13 miles to the Southeast. Montello, meaning "rest" in the Native American

language, has a population of approximately 150 people and was once used as a layover location for people traveling on the Southern Pacific Railroad. The FAA included launch commit criteria (LCC) conditions to the Part 101 waiver for this launch. SM Rocketry, the waiver applicant, needed to demonstrate that the rocket's flight safety system could initiate a third-stage motor abort if the rocket deviated from its flight path. Although the range of the rocket during the first and second stage burns was not far enough to reach Montello, the third stage booster had the capability of landing significantly downrange. The rocket was equipped with electronics that were used for ignition control and data collection and transmission. A micro-controller linked to a GPS unit provided real time position information. The rocket was programmed to receive numerous coordinate updates to ensure the designated flight limit lines (FLL) would not be exceeded as a result of the third stage boost. As a fail-safe mechanism, the FAA required a redesign of the ignition control logic to ensure the third stage would not ignite if there was an electronics failure. Approximately 20 seconds into flight, the rocket violated the FLL according to telemetry data received on the ground. The flight computer then automatically aborted the flight by not igniting the 3rd stage motor. Finally, the rocket returned to the ground, impacting harmlessly in a designated hazard area 11 kilometers from the launch site. Although the overall mission was unsuccessful, the rocket failed safely without harm to the public.

AST
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AST Summary Statistics	2000	2001	2002	2003	SUM
Licensed Launches	10	6	7	4	150

NOTE: Sums are the cumulative number of licensed launches that have occurred sine the first launch in 1989. Launches are through June 30, 2003. In addition to licensing launches, AST licenses commercial launch site operations. To date, four such sites have received licenses.

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